MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

DET5058 – DIGITAL ELECTRONICS

(DEE)

21 OCTOBER 2017
2.30pm – 4.30pm
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **5** pages (**4** pages with **4** questions and **1** page for appendix)
2. Answer **ALL** questions. All necessary working steps must be shown.
3. Write all your answers in the answer booklet provided.

QUESTION 1 [25 Marks]

a) Draw a graph with a waveform representing:

(i) Analog signal.
(ii) Digital signal.

[4 marks]

b) Name **FOUR** products which provides digital display to the user.

[4 marks]

c) List **TWO** Integrated Circuit (IC) technology to implement logic gates.

[2 marks]

d) Represent (–100) and (–20) in 2's complement form. Then, perform the mathematical operation (–100) ÷ (–20) in 2's complement form.

[15 marks]

QUESTION 2 [40 Marks]

Referring to Figure 1, answer the following questions.

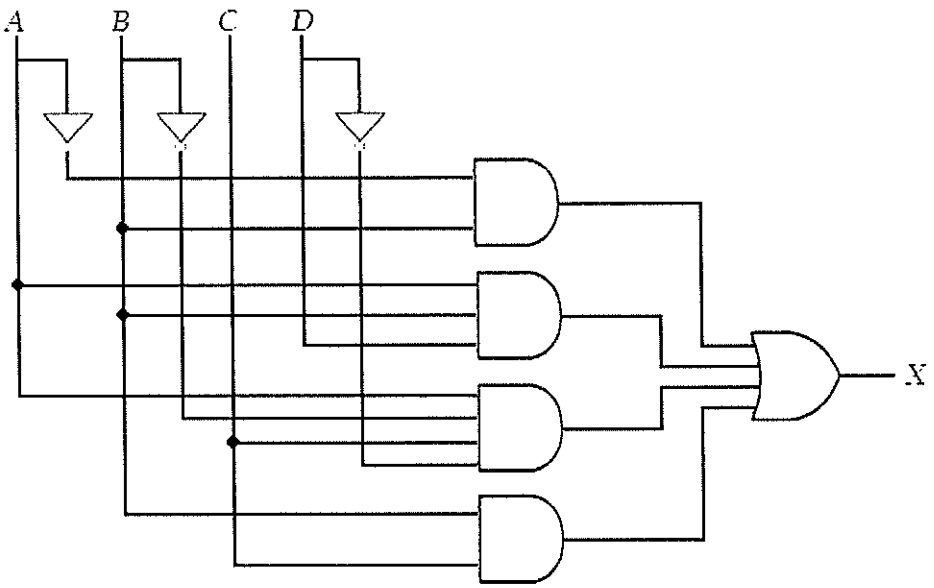

Figure 1

a) Provide the Boolean expression of the logic circuit.

[3 marks]

b) Rewrite the expression in (a) in standard SOP form.

[4 marks]

Continued...

QUESTION 2 (Continued)

c) Write the equivalent standard POS expression based on your answer in (b).

[4 marks]

d) Using two separate Karnaugh maps, simplify your answer in (b) and (c).

[9 marks]

e) Draw the simplified SOP expression in (d) using NOR gates **ONLY**.

[11 marks]

f) Draw the output waveform the logic circuit in Figure 1 based on the given input waveforms in Figure 2.

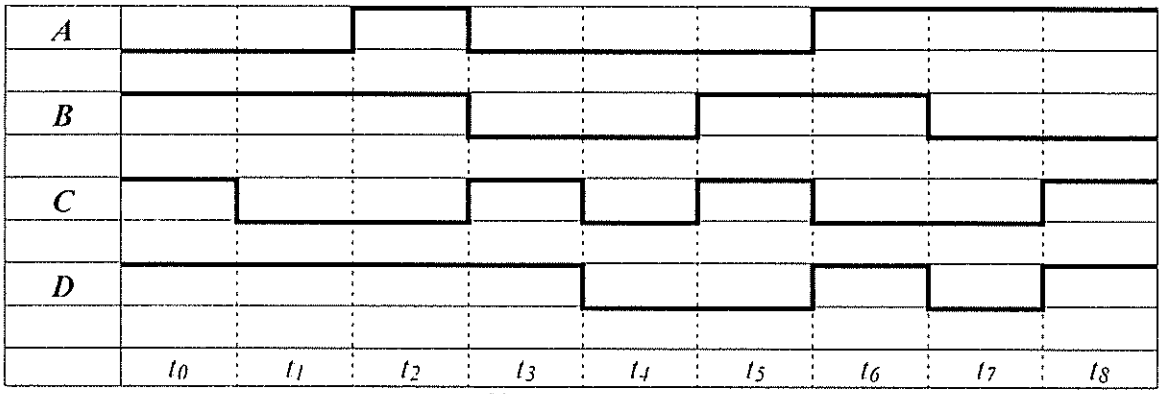

Figure 2

[9 marks]

Continued...

QUESTION 3 [20 Marks]

Referring to the block diagram in Figure 3, draw the waveform for C_0 output pin, and **ALL** the input and output pins of the BCD-to-decimal decoder, based on the given input waveforms for A_n and B_n in Figure 4.

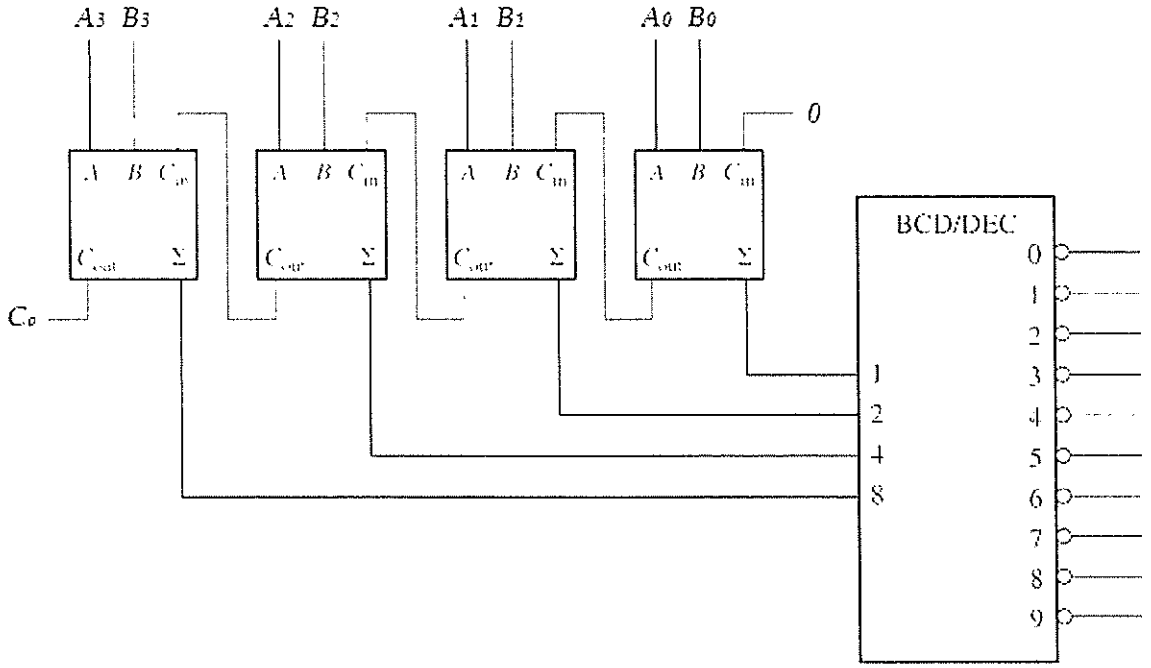

Figure 3

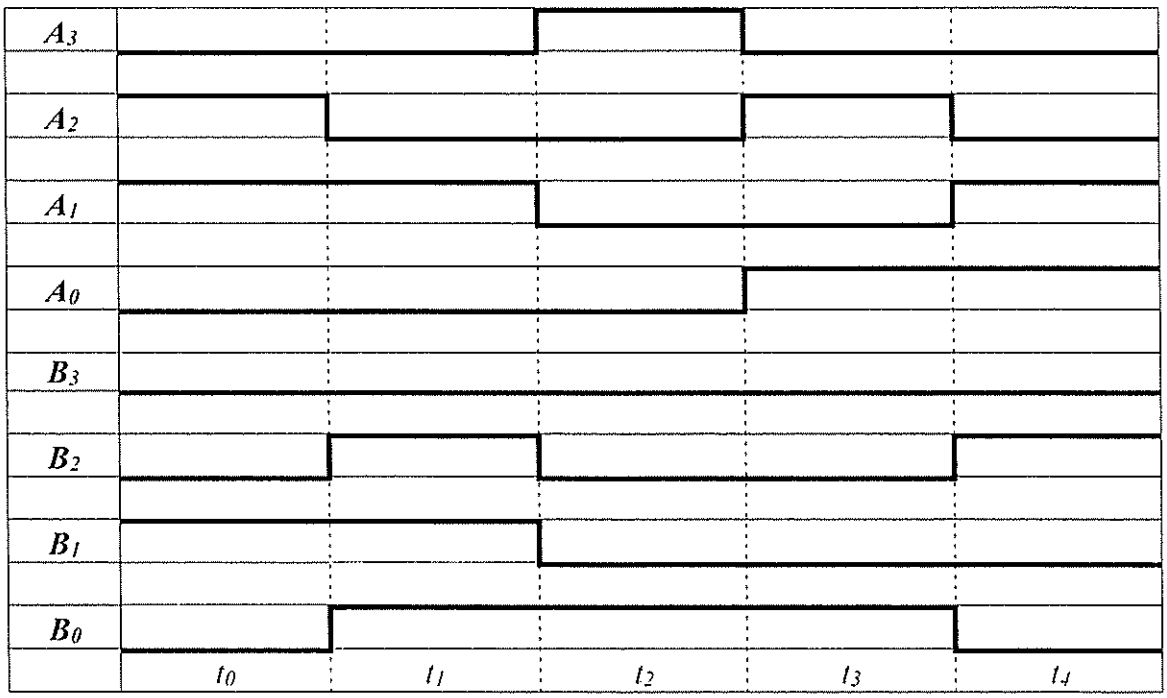

Figure 4

[20 marks]

Continued...

QUESTION 4 [15 Marks]

Referring to the characteristic table in Table 1, answer the following questions.

Table 1

Q	Q_{n+1}	X	Y
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

a) Name the flip-flop represented by the characteristic table.

[1 mark]

b) Draw the corresponding state diagram for the flip-flop named in (a).

[5 marks]

c) Is there any possibility for the flip-flop named in (a) is having an invalid state? Explain your answer with the aid of the logic diagram shown in Figure 5.

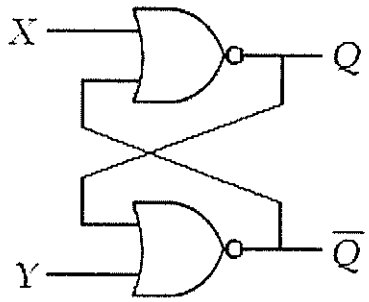

Figure 5

[5 marks]

d) Draw the output waveform of Q and $\overline{Q}$ based on the given input waveforms of X and Y in Figure 6. Assume the flip-flip is a positive edge-triggered type, and is initially LOW.

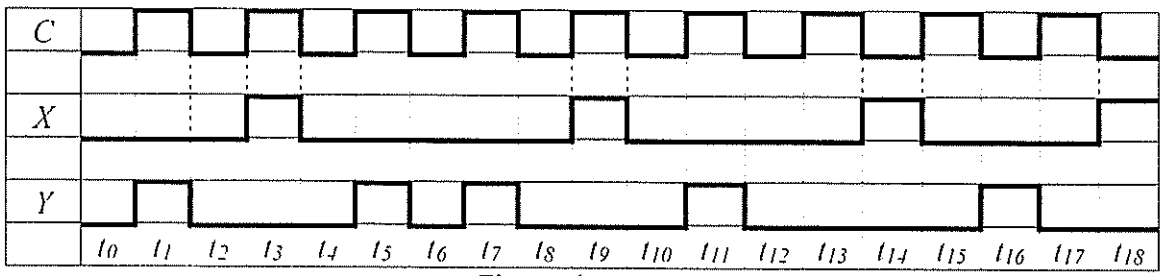

Figure 6.

[4 marks]

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APPENDIX: RULES OF BOOLEAN ALGEBRA

1. $A + 0 = A$
2. $A + 1 = 1$
3. $A \cdot 0 = 0$
4. $A \cdot 1 = A$
5. $A + A = A$
6. $A + \overline{A} = 1$
7. $A \cdot A = A$
8. $A \cdot \overline{A} = 0$
9. $\overline{\overline{A}} = A$
10. $A + AB = A$
11. $A + \overline{A}B = A + B$
12. $(A + B)(A + C) = A + BC$